PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in or relating to Lubricant Compositions

We, ACHESON INDUSTRIES INC., a Corporation organised and existing under the laws of the State of Michigan, United States of America, of 321, Michigan National Bank Building, Port Huron, Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with improvements in or relating to lubricant compositions.

More particularly one aspect of the invention relates to lubricant compositions of the type used for application to screw threaded members, particularly nuts and bolts, before assembly thereof to facilitate subsequent unscrewing particularly after exposure to corrosive atmospheres and/or high temperatures. Such lubricants may be termed "screw threaded lubricants".

Another aspect of the invention relates to so-called "anti-scuffing" lubricans, which term is applied to lubricant compositions adapted to be used to prevent "scuffing" or damage due to insufficient lubrication, particularly in newly machined parts during running in.

Screw thread lubricants and anti-scuffing lubricants will for convenience be referred to collectively as "lubricant compositions of the type described".

It has previously been proposed to prepare lubricant compositions of the type described on the basis of solid lubricants such as graphite and such compositions have proved reasonably effective in service. We have however been concerned to improve compositions of the type described and have found that a substantial improvement in performance is obtained by the inclusion in the composition of certain substances which have the power of forming adherent layers or films on metal surfaces, particularly surfaces of ferrous metals. The inclusion of such substances in the stated compositions appear to improve the adhesion of the lubricant to the metal surfaces, particularly at elevated temperatures.

According to the invention, therefore, we provide an improved lubricant composition of the type described in the form of a paste comprising (A) graphite or molybdenum disulphide as solid lubricant; (B) a film-froming additive comprising cadmium oxide, lead oxide (PbO), lead sulphide or zinc oxide; and (C) liquid hydrocarbon oil; the ratio of (A) to (M) being at least 1:1 by weight.

The solid lubricant which is particularly preferred in compositions according to the present invention is graphite. The graphite may be natural graphite or electric furnace graphite which preferably has a surface area of 1 to 500 square metres, and particularly 10 to 150 square metres, per gram.

The film-forming additives are substances capable of forming adherent layers or films on metal surfaces at temperatures at least up to 500°C. The preferred film-forming additive is cadmium oxide, particularly good results having been obtained with this substance.

Preferably the substance used as film-forming additive should be of small particle size, an average particle size of not greater than 10μ being preferred. In the case of cadmium oxide, for example, a particularly satisfactory material is one having an average particle size of from 0.5 to 2μ.

The compositions according to the invention are in the form of a paste and contain a liquid hydrocarbon oil as carrier. According to one feature of the invention, component (C) conveniently comprises a hydrocarbon oil of high boiling point whereby the paste remains plastic after exposure to the atmosphere.

Solvent neutral oils are particularly suitable hydrocarbon oils of this type. According to another feature of the invention, the composition according to the invention also comprises a low boiling liquid which evaporates when the composition is exposed to the atmosphere. White spirit is a particularly suitable low boiling liquid, whilst solvent naphtha, toluene and xylene may also be used. Under certain circumstances it may be advantageous to use a hydrocarbon oil of high boiling point alone as liquid carrier; usually, however, it is preferred to use a blend of a hydrocarbon oil of high boiling point and a low boiling liquid as the liquid carrier.

According to a still further feature of the invention, the compositions contain a wax, such as a hydrocarbon wax. Such a wax acts both as a carrier and a thickener and may obviate the need for inclusion in the compositions of a thickener as described below.

Preferably the proportion of film-forming additive in the composition is within the range of from 10—100%, particularly 35 to 100% and for example about 71%, by weight based upon the weight of solid lubricant. In the preferred compositions the proportion of inert carrier (that is of liquid hydrocarbon oil along with any other inert carrier present e.g. low boiling liquid or hydrocarbon wax) is in the range of from 25 to 300% by weight based upon the total weight of solids in the composition.

The compositions according to the invention may with advantage further include lead powder. Thus when the compositions are used as screw thread lubricants and are in service at high temperature the lead powder fuses and thereby acts to bind the composition in the screw threads, and prevent ingress of corrosive gases. Lead powder of about 300 mesh (B.S. Sieve Size BS No. 410—1943) is for example satisfactory. The proportion of lead powder is preferably not greater than 75% by weight, particularly 10—75% by weight and conveniently 16% by weight, based upon the total weight of solids in the composition.

The compositions according to the invention may further contain a dispersing agent for the solid lubricant. Suitable materials in the case of graphite include, for example, organic sulphonates of known kind e.g. a petroleum sulphate such as the material sold as Petromor M503. Such material may be incorporated in the composition to an extent preferably not greater than 50%, and conveniently in the range of from 2.0 to 20.0%, by weight based upon the weight of solid lubricant.

The composition according to the invention may also contain any desired fillers and/or thickening agents, such as finely divided amorphous silica, cellulosic thickeners e.g. ethyl cellulose, organically modified bentonite and montmorillonite clays, organic polymer thickeners or metal soaps. The filler may, for example, be incorporated in the composition in amounts not greater than 20% by weight based upon the total weight of solids in the composition, a proportion of 4.7% being, for example, generally satisfactory. Amorphous silica is the preferred filler, a suitable material being for example, one having a surface area of about 200 sq. metres per gram.

Where the compositions according to the invention are to be used as anti-scuffing lubricants, in addition to the ingredients heretofore stated, it is preferable to have present an extreme pressure additive. Such additives are well known in the art and consist of normally stable compounds which however react with metal surfaces at high temperatures such as develop at high loads to give a surface film of low shear strength which protects the metal surface from further damage. Suitable extreme pressure additives include, for example, chlorinated waxes such as that sold as Anglamol 40.

For the better understanding of the invention the following examples are given by way of illustration only:—

EXAMPLE 1

Screw thread lubricant

100 gms.	Graphite (Surface Area=100 sq m/gm)
71 gms.	Cadmium Oxide (Particles between 0.5 and 2.0μ diameter)
10.4 gms.	Amorphous Silica (Surface Area=approx. 175 sq m/gm)
3.4 gms.	Petromor M503
35 gms.	Lead Powder (300 mesh—B.S. Sieve Size BS No. 410—1943)

The above materials are placed in a mixing device and 88 gms. hydrocarbon oil (500 Solvent Neutral Oil) added together with sufficient white spirit (if necessary) to give a suitable paste. Masticate for 4 hours. Dilute with sufficient white spirit in the mixer to give a product of a consistency suitable for whisking in a high speed mixer. Transfer the material to a high speed mixer and whisk for 2 hours. Dilute to 50% solids with white spirit in the mixer.

EXAMPLE 2

Screw thread lubricant without lead powder

This composition is formulated as described in Example 1 except that the lead powder is omitted and 75 gms., instead of 88 gms., of hydrocarbon oil are used. After whisking in the high speed mixer, the composition is diluted with white spirit to a suitable consistency.

EXAMPLE 3

Anti-scuffing lubricant

This composition is formulated exactly as in Example 1 but with the addition of 22 gms. of Anglamol 40 (i.e. a chlorinated wax).

Sufficient white spirit is used in the final dilution in the mixer to give a suitable consistency for brushing and, after whisking in the mixer, white spirit is again added to give a composition of suitable consistency.

EXAMPLE 4
Screw Thread Lubricant

A composition is formulated as described in Example 1 except that the cadmium oxide is omitted and 97 gms. of lead oxide (PbO) of particle size between 0.5 and 2.0μ diameter are included in its place. After whisking in the high speed mixer, the composition is diluted with white spirit to a suitable consistency.

EXAMPLE 5
Screw Thread Lubricant

A composition is formulated as described in Example 1 except that the cadmium oxide is omitted and 20 gms. of lead sulphide of particle size between 0.5 and 2.0μ diameter are included in its place. After whisking in the high speed mixer, the composition is diluted with white spirit to a suitable consistency.

EXAMPLE 6
Screw Thread Lubricant

A composition is formulated as described in Example 1 except that the graphite is omitted and 200 gms. of particulate molybdenum sulphide having a surface area of 10—30 sq m/gm. are included in its place. After whisking in the high speed mixer, the composition is diluted with white spirit to a suitable consistency.

WHAT WE CLAIM IS:—

1. A lubricant composition of the type described in the form of a paste comprising (A) graphite of molybdenum disulphide as solid lubricant; (B) film-forming additive comprising cadmium oxide, lead oxide (PbO), lead sulphide or zinc oxide; and (C) a liquid hydrocarbon oil; the ratio of (A) to (B) being at least 1:1 by weight.

2. A composition according to Claim 1 in which the solid lubricant is graphite having a surface area 1 to 500 sq. metres per gram.

3. A composition according to Claim 2 in which the graphite has a surface area of 10 to 150 sq. metres per gram.

4. A composition according to any of the preceding claims in which the film-forming addtive has an average particle size of not greater than 10μ.

5. A composition according to Claim 4 in which the film-forming additive comprises cadmium oxide having an average particle size of from 0.5 to 2.0μ.

6. A composition according to any of the preceding claims in which the component (C) comprises a hydrocarbon oil of high boiling point whereby the paste remains plastic after exposure to the atmosphere.

7. A composition according to Claim 6 in which the hydrocarbon oil of high boiling point is a solvent neutral oil.

8. A composition according to any of the preceding claims containing as carrier a low boiling liquid which evaporates when the said paste is exposed to the atmosphere.

9. A composition according to Claim 8 in which the lower boiling liquid is white spirit.

10. A composition according to any of the preceding claims which also contains a wax.

11. A composition according to Claim 10 in which the wax is a hydrocarbon wax.

12. A composition according to any of the preceding claims in which the proportion of film-forming additive is in the range of from 10 to 100% by weight based upon the weight of solid lubricant.

13. A composition according to Claim 12 in which the proportion of film-forming additive is in the range of from 35 to 100% by weight based upon the weight of solid lubricant.

14. A composition according to any of the preceding claims in which the proportion of component (C) together with any other inert carrier present is in the range of from 25 to 300% by weight based upon the total weight of solids in the composition.

15. A composition according to any of the preceding claims which also contains lead powder.

16. A composition according to Claim 15 in which the proportion of lead powder is not greater than 75% by weight based upon the total weight of solids in the composition.

17. A composition according to Claim 16 in which the proportion of lead powder is in the range of from 10 to 75% by weight based upon the total weight of solids in the composition.

18. A composition according to any of the preceding claims which also contains a dispersing agent.

19. A composition according to Claim 18 in which the dispersing agent is an organic sulphonate.

20. A composition according to either of Claims 18 and 19 in which the dispersing agent is present in a proportion not greater than 50% by weight based upon the weight of solid lubricant.

21. A composition according to Claim 20 in which the proportion of dispersing agent is in the range of from 2.0 to 20.0% by weight based upon the weight of solid lubricant.

22. A composition according to any of the preceding claims which also contain a filler and/or thickening agent.

23. A composition according to Claim 22 in which the filler comprises amorphous silica.

24. A composition according to Claim 23

in which the amorphous silica has a surface area of about 200 sq. metres per gram.

25. A composition according to Claim 22 in which the filler and/or thickening agent comprises a cellulosic thickener, an organically modified bentonite or montmorillonite clay, an organic polymer thickener or a metal soap.

26. A composition according to any of Claims 22 to 25 in which the filler is present in a proportion not greater than 20% by weight based upon the total weight of solids in the composition.

27. A composition according to any of the preceding claims adapted for use as an anti-scuffing lubricant which also contains an extreme pressure additive.

28. A lubricant composition of the type described substantially as described in any of the Examples.

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